RF Threat Simulation

NDIA, 2-4 Nov 2005, Monterey, CA

Ben Rasnick

Hd, Airborne Threat Simulation Organization

Chair, Joint Service Battlespace Environment (JSBE)

NAWC WD, Pt Mugu, CA Code 5.394

NAWC
Weapons Division
NAVAL AIR WARFARE CENTER

THREAT / TARGET
AIR
SEA
LAND
SYSTEMS
DEPARTMENT

OUTLINE

NAVAIR ATSO

- PROGRAM OVERVIEW
- THE “SYSTEM”
- USE APPLICATIONS
- REQUIREMENTS PROCESS
- DEVELOPMENT PLAN
- TECHNOLOGY GROWTH OPPORTUNITIES

TECHNOLOGY GROWTH W/ INDUSTRY

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LIVE-VIRTUAL-CONSTRUCTIVE

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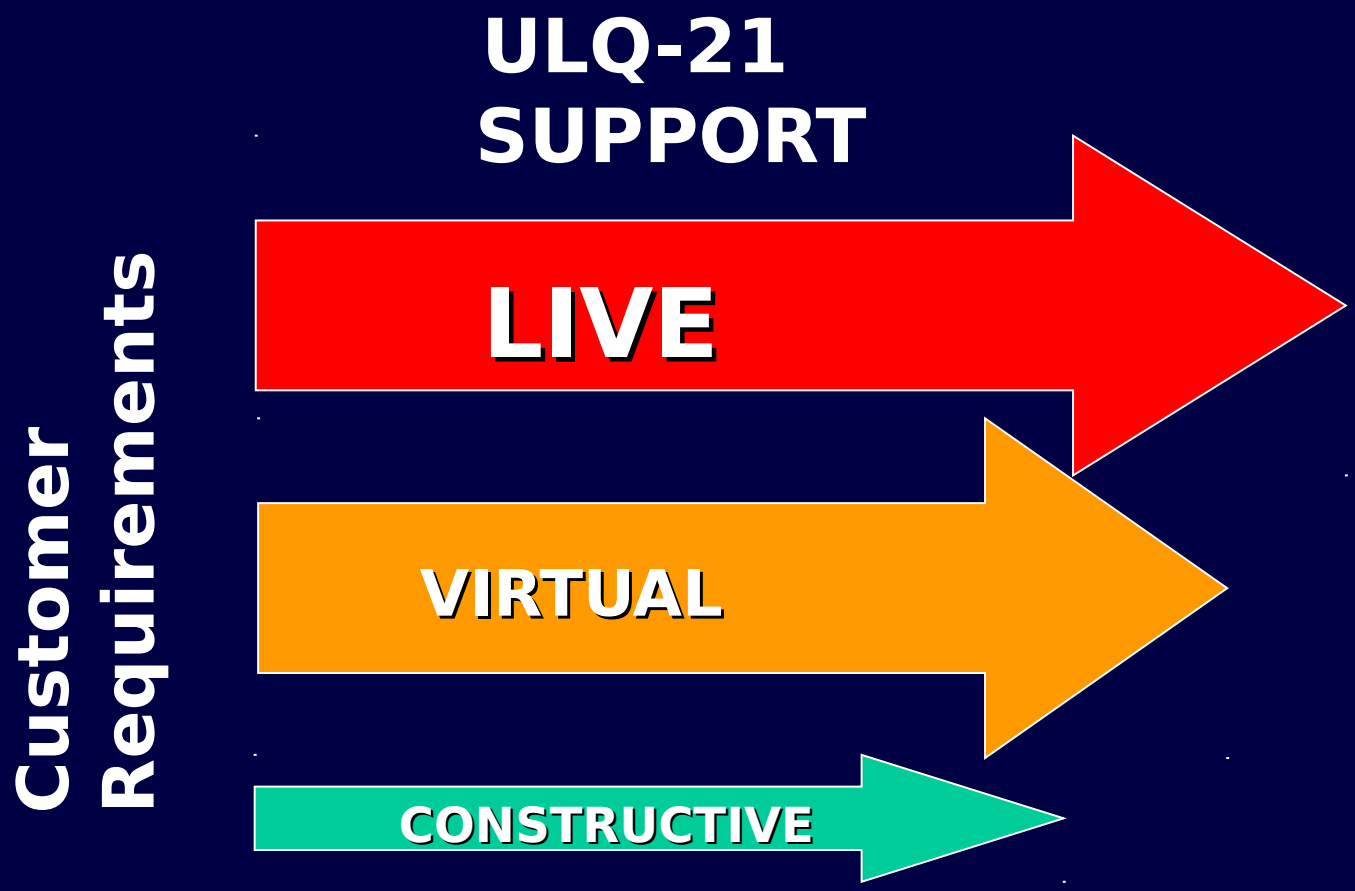

MISSION

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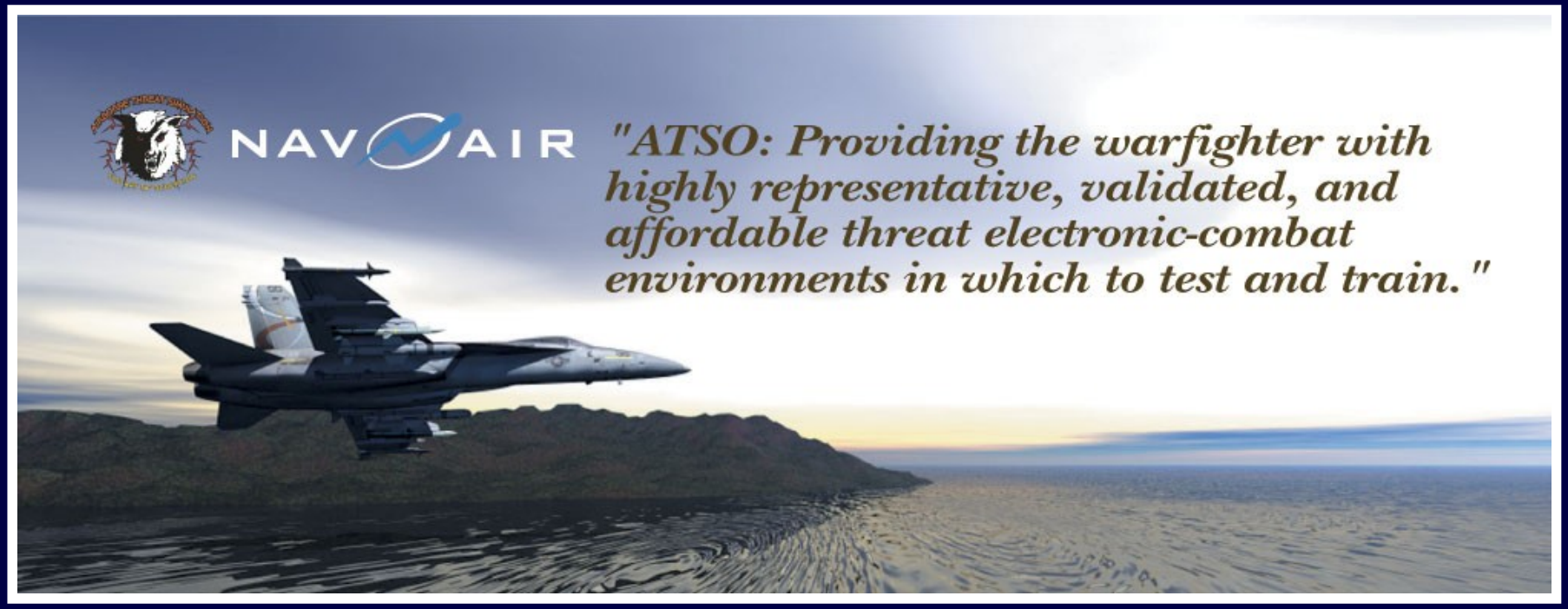
NAVAIR
"ATSO: Providing the warfighter with highly representative, validated, and affordable threat electronic-combat environments in which to test and train."

PROGRAM BREADTH

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- Laboratory RF Vulnerability Assessment
- RDT&E support / assessment (all RF weapons…)
- Targets live-fire
  - Air Force and Navy
  - Full-scale, Sub-scale, Supersonic, Land based, Surface Craft
- Training support
  - Fleet, Unit level, operator, etc
  - Land range support
    - Air Force and Navy

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ULQ-21 APPLICATION

SYSTEM DESIGN PHILOSOPHY

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- **Observed Capabilities**
  - **Simulator designs use the same basic technology as the Threat in order to preserve the RF spectrum**
  - **Basic threat technology is implemented using the most advanced technology affordable…Driven by miniaturization requirements**
- **Projected & Technologically Feasible Capabilities**
  - **Implemented with the most advanced technology affordable**
- **Limitations**
  - **Production simulators must be capable of being modified to incorporate advances as the Threats evolve**
  - **Precludes the affordable use of some advanced technologies (ASIC, MMIC)**

TECHNOLOGY BASE

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- Based on AN/ULQ-21 Countermeasures set
- Specifically: HYDRA (VME 3 U cards, CAN Bus, 1153, RS-232, Window's-like GUI)
- Combination of Commercial Sus-systems under HYDRA control/architecture
- Gov't specific integration

BUILDIING BLOCKS - AN/ULQ-21(V)

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PLATFORM ADAPTABLE

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AN/ALQ-167(V)

AN/DLQ-9(V)

INTERNAL BQM-34

VALIDATED SIMULATORS

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- IMPERSONATOR
- HAVE HAM
- TADPOLE
- HAVE ALL
  - All of the above in a single “dial-a-threat” system
  - Validated “High Fidelity”

Baseline HAVE ALL Configuration
(w/o Tadpole)

HAVE HAM MINIATURIZATION

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HAVE ALL
(W/O Tadpole)

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APPLICATIONS

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- Laboratory (ULQ-24B)
- Manned Aircraft (ALQ-167)
  - F-5, F-15, F-16, F/A-18, Lear, …
- Targets
  - Sub-Scale (Internal)
    - BQM-74E/F, BQM-34S, MQM-107, AFSAT/BQM-167?
  - Sub-Scale (Podded DLQ-9)
    - BQM-34A, MQM-107, AFSAT/BQM-167
  - Supersonic
    - AQM-37C, Vandal, GQM-163
  - Full-Scale (ALQ-167)
    - QF-4, AST
- Surface Craft
  - QST-35, Range Workboats, Commercial Vessels
- Land Based

FIBER OPTIC TOWED DECOY

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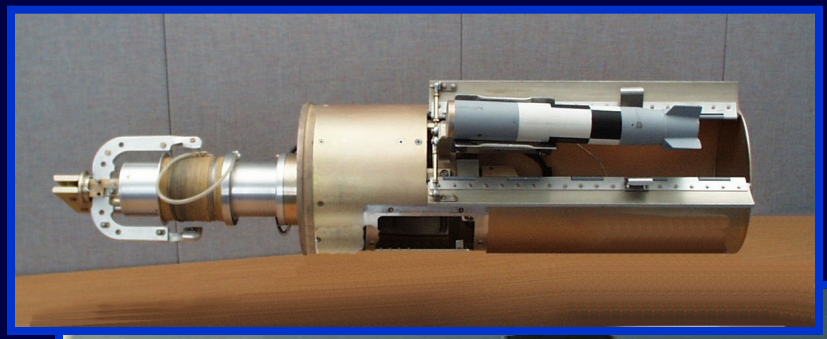
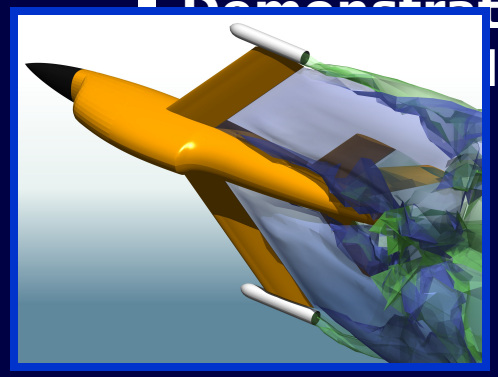
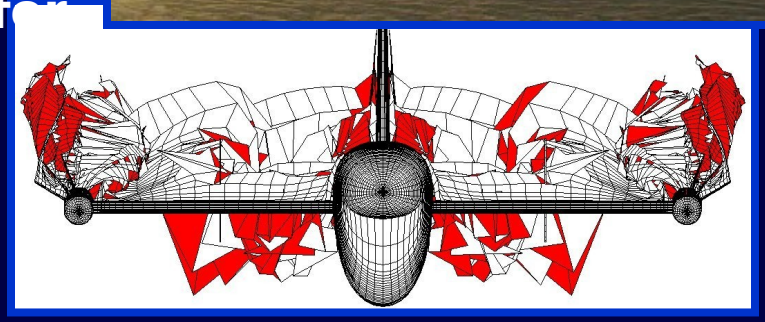
- Capability to provide all current RF threats though a towed transmitter (FOTD)
  - Modified AN/ALE-50 transmitter
- Available in the AN/ALQ-167
  - BQM-34S carriage under development
    - Demonstration
    - luled f







AN/AST-9 (V)
Radar Emission Simulating Set

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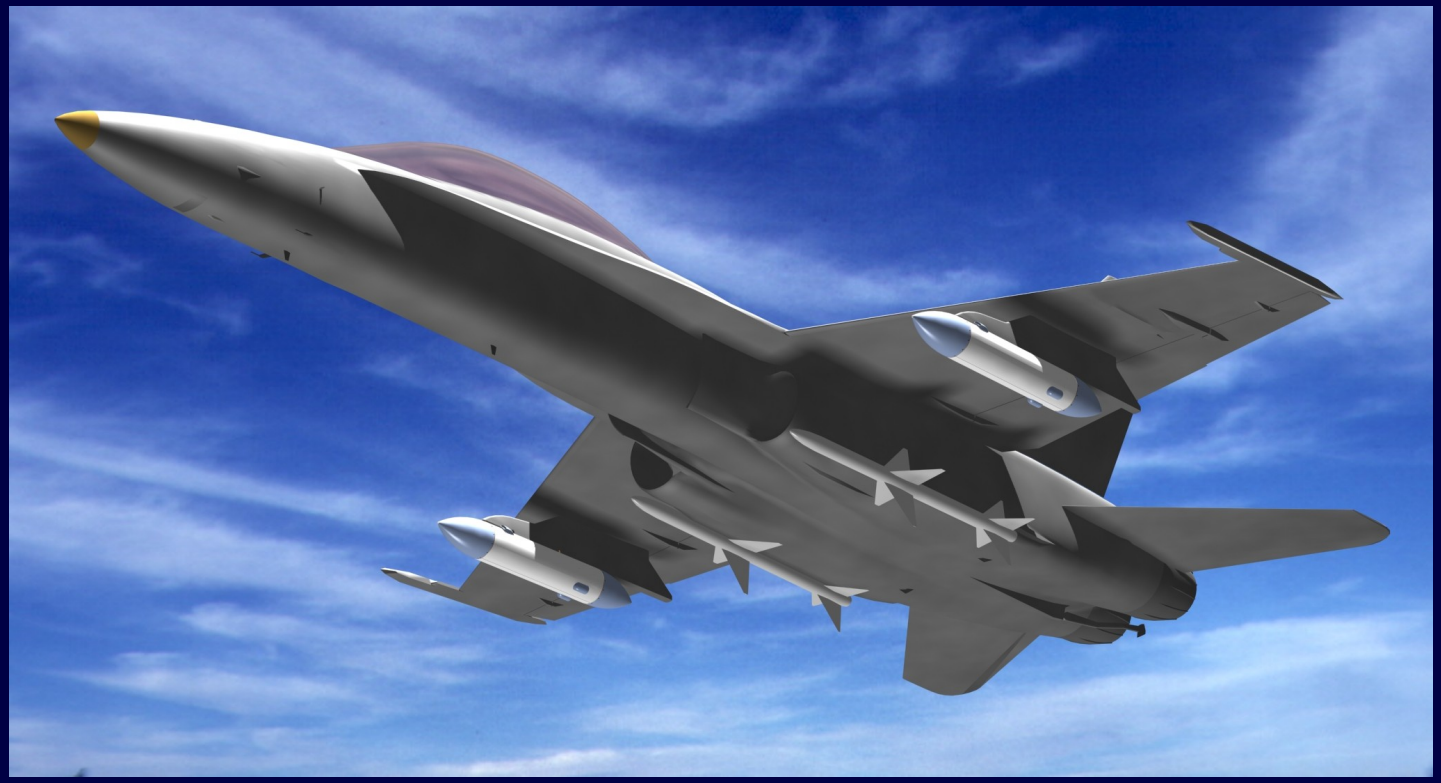

10/14/05

UNCLASSIFIED

TWTA or Magnetron Variant

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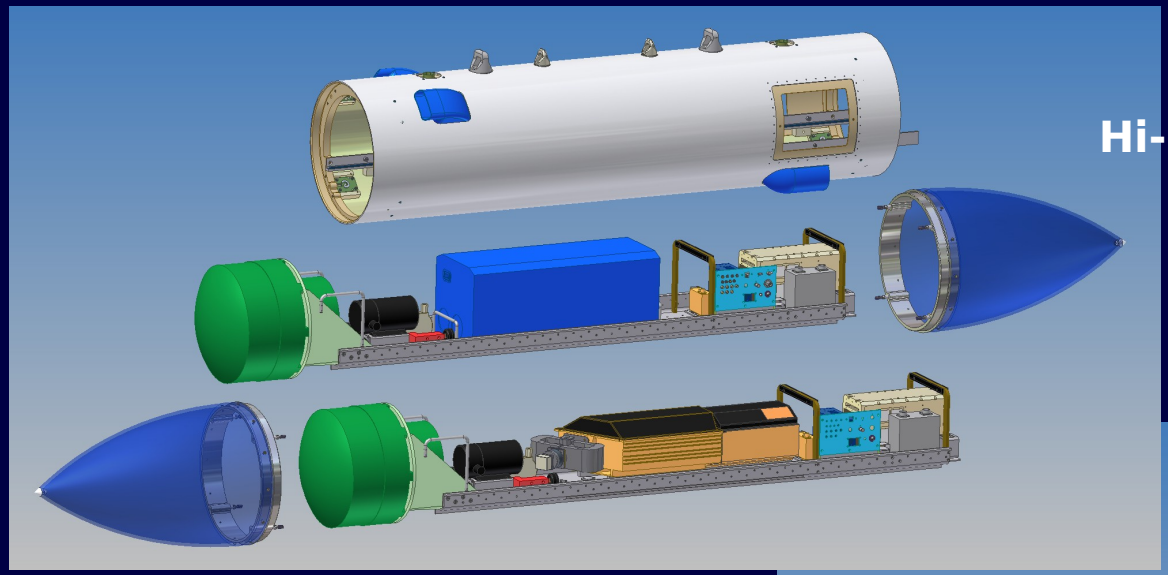


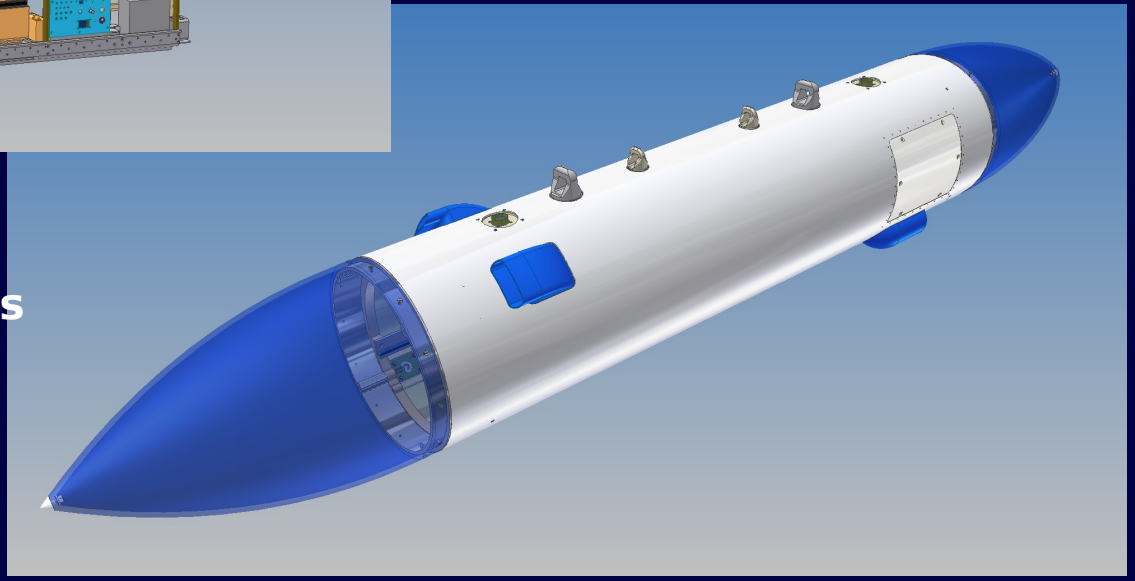
TWTA Variant

Hi-Power Pulse Doppler / CW Signa

High Power TWTA

Hydra Technique Controller

14” H/V SAS Antenna



Magnetron Variant

Hi-Power / Low Duty Cycle Signals

High Power Magnetron

Hydra Technique Controller

14” H/V SAS Antenna

OUTSIDE THE BOX

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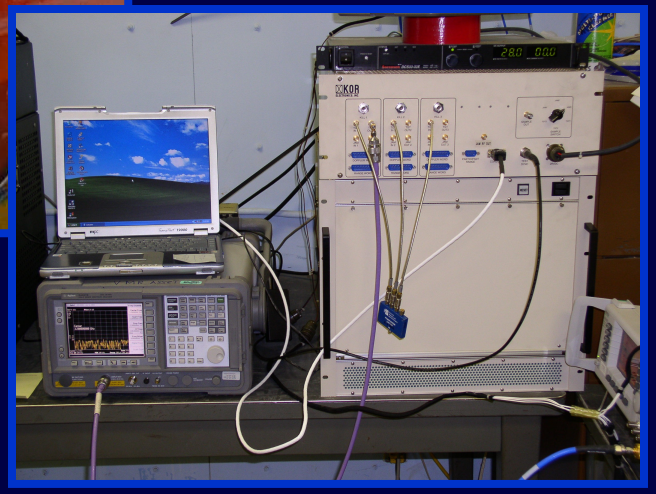

ELECTRONIC TARGET GENERATOR

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- Use of multiple DRFMs to electronically simulate multiple threats
  - Threat ASCMs, Aircraft, Targets with associated Jamming
- Land, Surface Craft or Helicopter Based
- ***Programmable***, Subsonic, Supersonic, any RCS or Scenario
- Target Launched Weapon, Stream Raid
- Limitations
  - Straight-Line Flight Profile For All Targets, No Kinematic Maneuvers
  - Minimum Range Limited by Ship-to-ETG Separation Distance (2-4 nmi)
  - Does Not Simulate Some Target Elevation Phenomena
- Additional Developments Required
  - Complex RCS Variations & Multipath Software Enhancements (FY-05 TMI)
  - Expanded Frequency Coverage
  - Accreditation

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REQUIREMENTS

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SOURCES

- The THREAT
  - Observed Capabilities
  - Projected Capabilities
- Weapons Programs
  - Technically Feasible Capabilities
- Training Requirements

RDT&E PRIORITIZATION

- Bi-Annual Tri-Service EA Threat Workshop
  - Participation
    - Army, Navy, Air Force, OSD
    - Intel Community, Sponsors, Weapon Systems & Targets Program Offices, Weapon Systems Developers, DT/OT Users, “Fleet Users”

PRODUCT

- “Top 20” Threat Listing
  - By Specific Threat or Group of Threats
  - By EA Technique
- Drives 8-Year Development Plan in the POM

THE "TOP 20"

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TRI-SERVICE RF EA Threat Working Group 2005

DIVERSIFYING THREAT

The third bi-annual Tri-Service Threat Working Group will be held in late June at the Naval Air Warfare Center Weapons Division (NAWCWPNS), Pt Mugu, CA to provide the fighter and surface weapons community with an update of airborne threat electronic attack (EA) systems. The goal of the two day meeting will be to update the "Top 20 EA Threat" list. In the past, this list has proven valuable for the test, evaluation, and training communities in providing a simplified sub-set of threats from which to choose.

Airborne Threat Simulation
Point Mugu, California
June 21-22

RDT&E

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- Primarily NAVY (PMA-208) and Weapons Systems Development Program funded
- Supplemented with some OSD funding
- Plan through 2013
  - Advanced Threat Simulation Capabilities
  - Antennas
  - Amplifiers
  - Technique generators

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TTSP FY-06 Development Plan

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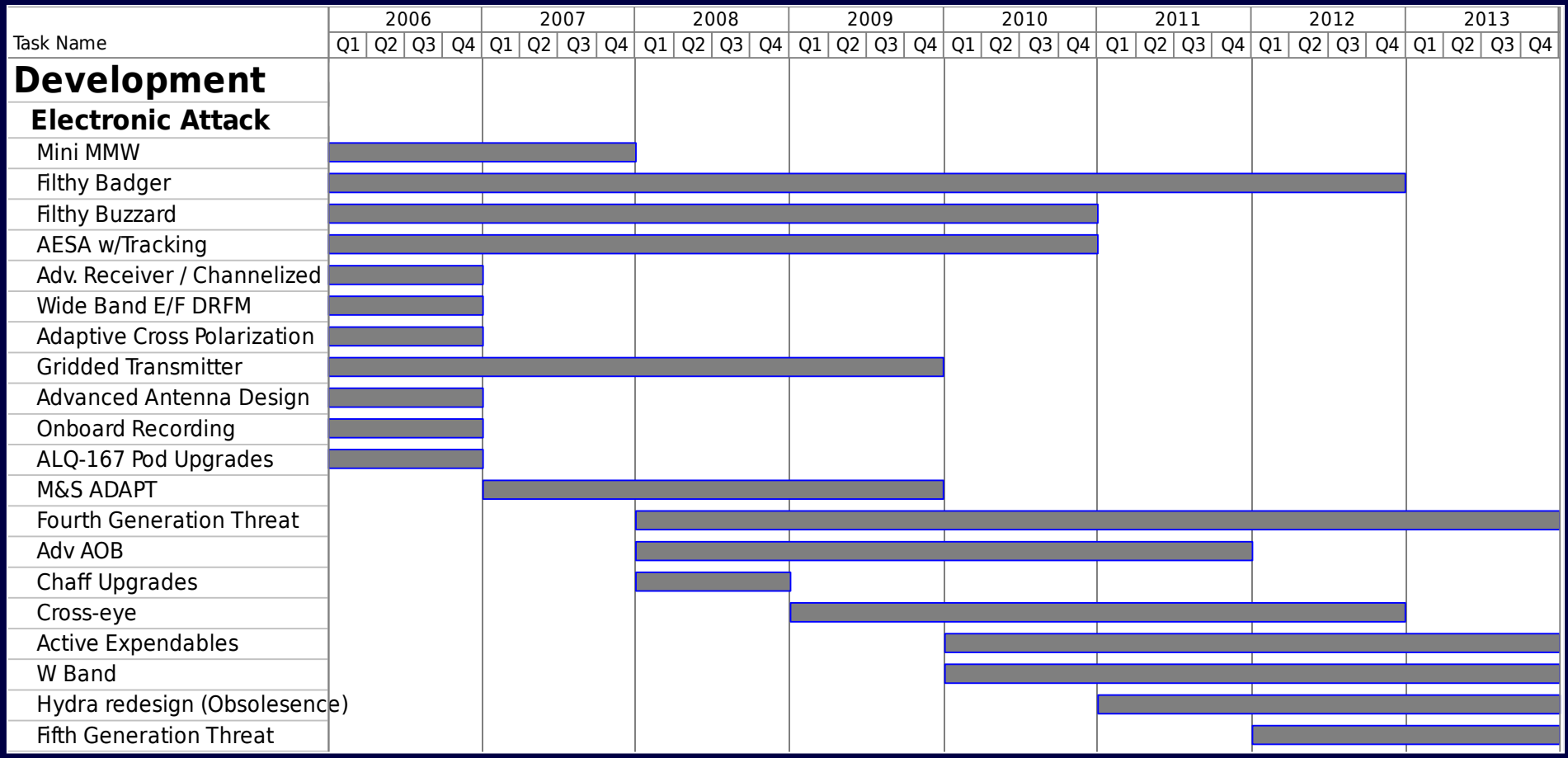

TTSP FY-06 Development Plan
(Continued)

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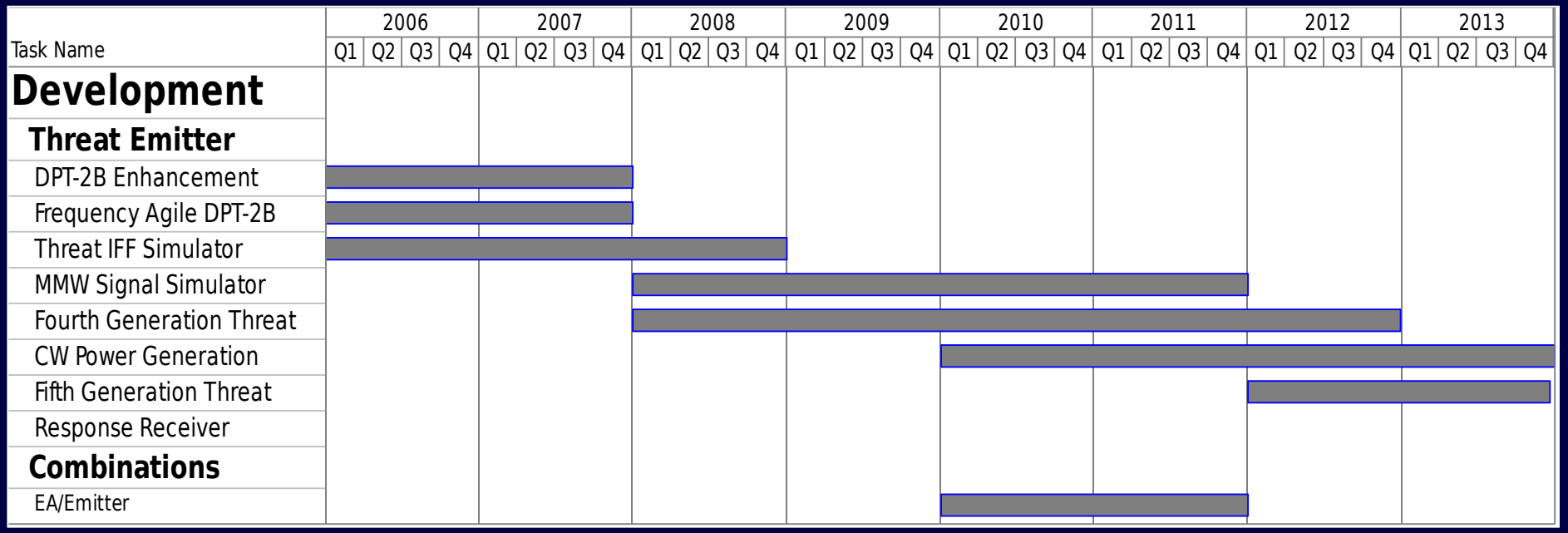
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Development
Threat Emitter
DPT-2B Enhancement
Frequency Agile DPT-2B
Threat IFF Simulator
MMW Signal Simulator
Fourth Generation Threat
CW Power Generation
Fifth Generation Threat
Response Receiver
Combinations
EA/Emitter

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TECHNOLOGY WISH LIST

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- Modular & affordable EA-AESA (scalable)
- Out-of-band (non I-Band) TWTA at 100W or greater
  - Comm's (DL, Radios, Sats)
  - GPS
  - Other…
- Gated TWTA (200-500W)
- DRFM on a Card
- Cross-eye (again…affordable for live-fire support)
- Generic Channelizer for adaptation to AN/ULQ-21
- Isolation enhancements (active cancellation, etc)

Leverage tactical efforts with adaptation for low-cost/scaled use in threat simulations

"OFFERING" TO INDUSTRY

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- ULQ-21 for various tactical uses and roles:
  - SOJ
  - SIJ
  - Feint (Radar Simulation)
  - Self-protect
  - Asymmetric (OIF/OEF)
- Platforms:
  - UAV
  - UCAV
  - Ground-based

WHY?

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- ULQ-21 NRE complete (in many applications)
- System miniaturized for use in UAV's anyway (targets)
- Widely tested against "blue"!
- Priced for destruction
  - Fidelity vs cost is always in tension
  - Makes for a better product

CONTACTS

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